Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	**)**	
Biennial Regulatory Review – Amendment of Parts	**)**	
1, 22, 24, 27, and 90 to Streamline and Harmonize	**)**	WT Docket No. 03-264
Various Rules Affecting Wireless Radio Services	**)**	

Joint Reply Comments of WCS Wireless LLC and XM Satellite Radio Holdings Inc.

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SUMMARY

WCS Wireless and XM support the Commission's proposal to create greater parity in its radiated power limits for newer wireless technologies by, among other things, (i) measuring Effective Isotropically Radiated Power ("EIRP") for base stations in various services in terms of average power rather than peak power and (ii) adopting a power spectral density ("PSD") limit as an alterative to the current per carrier EIRP limit. While these proposals enjoy the overwhelming support of the wireless industry, one entity expresses concern with respect to one specific frequency band. This same entity, however, has been an advocate of average power and the PSD concept in another proceeding involving a different frequency band, yet it provides no justification for its disparate treatment of the two bands.

Consistent with the overwhelming support in the record for both of these proposals, and as entities that are preparing to deploy an advanced mobile multimedia system using new wideband, non-constant envelope technology, WCS Wireless and XM urge the Commission to adopt these proposals for base stations in all services regulated under Parts 24 and 27 of the Commission's rules, including those in the 2.3 GHz Wireless Communications Service ("WCS") band. The new rules will enable the deployment of exciting new services to the public without causing an increase in the potential for interference.

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WCS Wireless, LLC ("WCS Wireless") and XM Satellite Radio Holdings Inc. ("XM") hereby file these Joint Reply Comments in the above-referenced proceeding. As discussed herein, WCS Wireless and XM applaud the Commission's efforts to remove unintended disadvantages in emission limits for newer technologies. With this goal in mind, for base stations in services regulated under Parts 24 and 27 of the Commission's rules, WCS Wireless and XM urge the Commission to (i) specify the Effective Isotropically Radiated Power ("EIRP") limit in terms of average rather than peak power and (ii) adopt a Power Spectral Density ("PSD") limit.

I. INTEREST OF WCS WIRELESS AND XM IN THIS PROCEEDING

WCS Wireless and XM are pioneers and innovators in developing use of their respective licensed frequency bands. WCS Wireless is the largest licensee of 2.3 GHz Wireless Communications Services ("WCS") spectrum, which is regulated under Part 27 of the Commission's rules. *See* 47 C.F.R. pt. 27. Many of its principals have been working since 1998 to deploy datacasting networks in the band. XM is the leading provider of satellite radio service in the world today. As of the end of 2005, XM had nearly six million subscribers. In July 2005, WCS Wireless and XM announced their proposed merger, thereby allowing these spectrum innovators to accelerate the development of 2.3 GHz WCS frequencies that have long been

fallow.[1] They also requested FCC consent for the proposed transaction.[2] WCS Wireless and XM are currently designing a one-way, point-to-multipoint network for the 2.3 GHz WCS band that uses a wideband, non-constant envelope technology. WCS Wireless and XM currently contemplate using this network to provide mobile multimedia services similar to those being provided or under development by entities such as Crown Castle in the 1670-1675 MHz band and QUALCOMM in the 700 MHz band.

In May 2005, almost three months prior to the initiation of this proceeding, WCS Wireless submitted a waiver request asking for authority to operate its WCS base stations in the 2.3 GHz band at average rather than peak in-band power.[3] As WCS Wireless demonstrated, grant of the requested waiver will allow the use of state-of-the-art, spectrally efficient, non-constant envelope modulation schemes and will facilitate deployment of a WCS network as efficiently as possible to serve as many people as possible, all without contributing to any harmful interference to others.[4] The majority of the parties in that proceeding supported the WCS Wireless request.[5] The Wireless Communications Association International, Inc. ("WCA"), which itself has supported the concept of average power in another proceeding involving a different frequency band,[6] and two of its individual members, opposed this request,[7]

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[1] *See* Press Release, *XM Satellite Radio to Acquire WCS Wireless* (July 13, 2005) (available at http://www.xmradio.com/newsroom/screen/pr_2005_07_13.html).

[2] *See* Application for Transfer of Control of WCS Wireless License Subsidiary, LLC from WCS Wireless, Inc. to XM Satellite Radio Holdings Inc., File No. 0002240823, WT Docket No. 05-256 (filed July 15, 2005).

[3] *See Wireless Telecommunications Bureau Seeks Comment on WCS Wireless, LLC Request for Waiver of Section 27.50(a), Public Notice*, DA 05-1662 (June 15, 2005).

[4] *See* WCS Wireless, Amended Request for Waiver, DA 05-1662 (May 16, 2005).

[5] *See* Joint Comments of Sirius and XM, DA 05-1662 (July 5, 2005).

[6] *See Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules, Notice of Proposed Rule Making and Memorandum Opinion and Order*, WT Docket No. 03-66, FCC 03-56 (rel. April 2, 2003);

based on an interference claim that WCS Wireless and XM have demonstrated to be baseless.[8] The record in that proceeding is now closed and is ripe for a decision.

The above demonstrates the unique capabilities and perspective that WCS Wireless and XM bring to this proceeding.

II. BACKGROUND OF THE PROCEEDING

FNPRM. In August 2005, the Commission released the above-captioned *Further Notice of Proposed Rulemaking* ("*FNPRM*")[9] proposing to revise its radiated power limits for base stations consistently across wireless services governed by Parts 24 and 27 of the Commission's rules, including in the 2.3 GHz WCS band. *FNPRM* at ¶ 54. One revision proposed in the *FNPRM* would specify radiated power in terms of average rather than peak power. *FNPRM* at ¶¶ 68-70. The Commission explains that emissions from older technologies, such as analog cellular, exhibit a "constant envelope" modulation, meaning that there are no peaks or valleys in the modulated waveform. *Id*. at ¶ 68. As such, the peak power of an emission does not deviate from the average power. The Commission explains that "newer and more efficient digital

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Wireless Communications Ass'n Int'l, Nat'l ITFS Ass'n and Catholic Television Network, "A Proposal For Revising The MDS And ITFS Regulatory Regime," RM-10586 (filed Oct. 7, 2002).

[7] *See* Wireless Communications Association International, Inc., Opposition to Amended Request for Waiver, DA 05-1662 (July 7, 2005) ("*WCA Opposition*"); Joint Comments of Allegheny Communications and Central States Communications, Inc., DA 05-1662 (July 5, 2005); Comments, BellSouth Wireless Cable, Inc., DA 05-1662 (July 5, 2005).

[8] WCA has claimed that a grant of the waiver will permit the grantee to increase its out-of-band emissions. *See WCA Opposition*; Wireless Communications Association International, Inc., Reply, DA 05-1662 (July 15, 2005). In fact, as both WCS Wireless and XM have explained, the waiver request is limited to 47 C.F.R. § 27.50, involving the measurement of in-band EIRP, and does not implicate 47 C.F.R. § 27.53(a)(3), which governs out-of-band emissions. *See* WCS Wireless, Reply Comments, DA 05-1662 (July 15, 2005); WCS Wireless, Response to WCA Submissions, DA 05-1662 (August 19, 2005); *see also* XM, Reply, DA 05-1662 (July 15, 2005); Letter from William Bailey, XM, to Ms. Marlene H. Dortch, FCC, DA 05-1662 (September 16, 2005).

[9] S*ee In the Matter of Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services, Report and Order and Further Notice of Proposed Rulemaking*, WT Docket No. 03-264, FCC 05-144 (2005) ("*FNPRM*").

technologies," however, exhibit a non-constant envelope modulation, where peak power deviates from average power. *Id*. at ¶ 69. To account for these new and more efficient technologies, the Commission proposes to specify radiated power in terms of average rather than peak power. *Id*. at ¶ 70. To the extent it adopts this proposal, the Commission seeks input as to whether it should also adopt a limit on peak-to-average ratio ("PAR"). *Id*. at ¶ 70.

Another revision proposed in the *FNPRM* would limit base station EIRP to a certain "power spectral density" ("PSD"), or power per unit of bandwidth, as an alternative to the current per carrier EIRP limit. *FNPRM* at ¶ 55. The Commission notes that narrowband technologies, such as GSM, can transmit more carriers in a given spectrum block than wideband technologies, such as OFDM. *Id*. at ¶ 51. As a result, the current per carrier EIRP limit favors narrowband technologies over wideband technologies by permitting narrowband operators to transmit greater aggregate power over the same bandwidth. *Id*. at ¶ 58. In order to level the playing field between different technologies with respect to aggregate power, the *FNPRM* proposes an alternative PSD limit of watts/MHz to approximate the per carrier EIRP limit for narrowband technologies over the same bandwidth. For example, given that narrowband PCS systems can generally transmit at least two carriers per MHz with a per carrier EIRP limit of 1640 watts, the aggregate EIRP per MHz for these systems amounts to at least 3280 watts (*i.e*., 2 x 1640 watts). Accordingly, the Commission proposes a PSD limit of 3280 watts/MHz to provide wideband PCS systems with an aggregate EIRP similar to narrowband PCS systems. *Id*. at ¶ 62.

Comments in response to FNPRM. The Comments submitted in response to the *FNPRM* overwhelmingly support the Commission's proposal to specify the EIRP limit for base stations across wireless services in terms of average rather than peak power. These Comments note that

an average power specification for base station EIRP (i) will not result in increased interference;[10] (ii) more accurately represents the radiated power of non-constant envelope technologies;[11] (iii) will result in more cost-efficient deployment of wireless networks;[12] and (iv) is consistent with industry practice,[13] the Commission's rules measuring out-of-band emissions,[14] and the Commission's interpretation of its own rules.[15] These Commenters also agree that the Commission should not limit PAR because (i) it would unnecessarily restrict wideband technologies;[16] (ii) would serve no regulatory purpose because wireless operators already have incentives to minimize PAR;[17] and (iii) would be unnecessarily confusing.[18]

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[10] *See* Comments of CTIA – The Wireless Association, WT Docket No. 03-264 (December 19, 2005) ("*CTIA Comments*"), at 10 (noting that a peak measurement "only captures and represents the power peaks with duration of sub-micro seconds that occur with a low probability in the band and thus artificially assigns a much higher power in the band than levels observed during operation"); Comments of Ericsson Inc., WT Docket No. 03-264 (December 19, 2005) ("*Ericsson Comments*"), at 16, 21; Comments of Motorola, Inc., WT Docket No. 03-264 (December 19, 2005) ("*Motorola Comments*"), at 4; Comments of QUALCOMM, Inc., WT Docket No. 03-264 (December 19, 2005) ("*QUALCOMM Comments*"), at 9-10.

[11] *See CTIA Comments* at 10 ("Using peak measurements for non-constant envelope technologies . . . does not provide an accurate picture of the power in the band."); *Ericsson Comments* at 16 ("The peak measurement method only captures and represents power peaks that occur with low probability and for an extremely brief duration (sub-micro seconds). Thus, peak measurement artificially assigns a much higher power measurement in the band than levels typically observed during operation for these technologies."); *Motorola Comments* at 4.

[12] *See CTIA Comments* at 10; *Ericsson Comments* at 16 ("To comply with peak-measured limits, operators would have to decrease base station average output power, reducing the coverage and capacity of their networks significantly.").

[13] *See Ericsson Comments* at 17-18; *Motorola Comments* at 4.

[14] *See Ericsson Comments* 18-19.

[15] *See Ericsson Comments* at 17.

[16] *See CTIA Comments* at 10.

[17] *See CTIA Comments* at 10 ("market forces already operate to minimize PAR, as there is a direct correlation between higher PAR and the cost of equipment and deployment."); *Ericsson Comments* at 19 ("PAR is directly correlated to equipment and deployment costs, and is thus kept to a minimum in practice."); *QUALCOMM Comments* at 9-10.

[18] *See CTIA Comments* at 10.

Commenters are also nearly unanimous in their support of the PSD concept, explaining that a PSD limit (i) is consistent with prior Commission decisions;[19] (ii) will particularly benefit entities deploying one-way and point-to-multipoint networks;[20] (iii) will not result in increased interference because operators deploying narrowband carriers are already permitted to transmit an aggregate base station EIRP that is even greater than the proposed PSD limit;[21] (iv) will result in a more cost-efficient deployment of wireless networks;[22] (v) will provide for increased data rates;[23] (vi) will result in improved indoor coverage;[24] and (vii) will achieve parity in aggregate power between wideband and narrowband systems.[25]

[19] Comments of Crown Castle International Corp., WT Docket No. 03-264 (December 19, 2005) ("*Crown Castle Comments*"), at 9 (citing *Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands*, *Memorandum Opinion and Order*, WT Docket No. 02-146, FCC 05-45 (March 3, 2005), at ¶ 39; *Wireless Operations in the 3650-3700 MHz Band, Report and Order and Memorandum Opinion and Order*, ET Docket No. 04-151, FCC 05-56 (March 16, 2005), at n.102).

[20] *Id.* at 6.

[21] *See CTIA Comments* at 6-7 ("[A]ny interference created by a wideband emission operating at the proposed limits would not be more than the interference created by legacy technology operating at the current limits."); *Crown Castle Comments* at 9-10 ("The proposal to implement an alternative PSD limit will not result in any greater risk of interference compared to the current rules. Indeed, the proposal seeks no new radiated emission levels that could not already be achieved using narrowband technologies."); *Ericsson Comments* at 9-10; Comments of Powerwave Technologies, Inc., WT Docket No. 03-264 (December 19, 2005) ("*Powerwave Comments*"), at 3, 5-6; *QUALCOMM Comments* at 2-3, 7-8.

[22] *See CTIA Comments* at 4-5; *Crown Castle Comments* at ii, 6 (noting that PSD limit for its one-way, broadcast-type network "would result in a 67% to 80% reduction in the number of base stations required to serve a market, permit a faster deployment of service and result in substantial savings that would translate into a more affordable offering"); *Ericsson Comments* at 6-7; *Motorola Comments* at 2; *Powerwave Comments* at 4.

[23] *See CTIA Comments* at 4-5.

[24] *See Crown Castle Comments* at 2; *Ericsson Comments* at 6-7.

[25] *See CTIA Comments* at 6 (noting that a PSD limit "does not increase permissible radiated power levels but rather evens the playing field between narrowband and wideband emissions"); *Crown Castle Comments* at 1; *Motorola Comments* at 2; *QUALCOMM Comments* at 2-3, 7-8.

III. DISCUSSION

A. THE COMMISSION SHOULD SPECIFY BASE STATION EIRP IN TERMS OF AVERAGE POWER FOR PART 24 AND PART 27 SERVICES

Consistent with the industry consensus reflected in the Comments, WCS Wireless and XM support the Commission's proposal to amend its rules to specify the EIRP limit for base stations in Parts 24 and 27 of the rules in terms of average power, and to do so without specifying a limit on PAR. Only one commenter claimed that an average power specification will result in harmful interference. Those claims, however, are unsubstantiated and speculative.[26] Moreover, while WCA refers to its filings in the pending WCS Wireless waiver proceeding to support its harmful interference claims, these claims have been refuted previously by WCS Wireless and XM.[27] Its assertion that "numerous" WCS licensees "are deploying" low-powered cellular wireless broadband systems in the 2.3 GHz band was not, and could not, be substantiated. *See WCA Comments* at 4. In fact, other than efforts made by WCS Wireless and XM, there appears to have been minimal (at best) deployment of systems of any kind to date in the 2.3 GHz WCS band. Moreover, even if some limited low-powered cellular systems may have been deployed, there is no reason to believe that these systems will suffer harmful

[26] *See* Comments of Wireless Communications Association International, Inc., WT Docket No. 03-264 (December 19, 2005) ("*WCA Comments*"), at 4-5. The Commission has held that it will not refrain from authorizing new services or adopting new technical rules based on speculative and unsubstantiated claims of interference such as those presented by WCA. *Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, Memorandum Opinion and Order and Further Notice of Proposed Rule Making*, 18 FCC Rcd 3857, FCC 03-33 (March 12, 2003), at ¶ 135 ("ARINC and ATA provide no technical support for their claims that the operation of UWB devices under the adopted standards will result in harmful interference. . . . Absent any evidence that UWB operation under the rules could result in harmful interference to the authorized radio services, we find no justification for the petitioner's request").

[27] *WCA Comments* at 4-5; *see* WCS Wireless, Reply Comments, DA 05-1662 (July 15, 2005); WCS Wireless, Response to WCA Submissions, DA 05-1662 (August 19, 2005); *see also* XM, Reply, DA 05-1662 (July 15, 2005); Letter from William Bailey, XM, to Ms. Marlene H. Dortch, FCC, DA 05-1662 (September 16, 2005). WCS Wireless and XM hereby incorporate into this docket by reference its arguments in the pending waiver proceeding.

interference if the Commission were to specify the EIRP limit in terms of average power. As the record reflects, average power provides a more accurate representation of the interference potential of non-constant envelope technologies, and base stations operating pursuant to an average rather than peak power specification will not cause increased interference. *See CTIA Comments* at 10; *Ericsson Comments* at 16, 21; *Motorola Comments* at 4; *QUALCOMM Comments* at 9-10. Indeed, the entities that support adoption of an average power specification, such as CTIA and its members, have deployed or are planning to deploy low-powered cellular-like systems in the PCS and AWS bands. If average power is acceptable for operators of these low-powered cellular-like systems, there is no legitimate reason why it should not also be acceptable for operators of similar systems in the 2.3 GHz WCS band, to the extent these systems are deployed.

WCA's opposition to the use of an average power specification for 2.3 GHz WCS base stations is a superficial attempt to hinder the development of other licensees in the band – licensees with real business plans, real investment, and real promise to actually meet the Commission's July 2007 substantial service deadline. There is no reason to single out the 2.3 GHz WCS band for special treatment by depriving licensees in this band of the flexibility to operate base stations at an average power limit.[28] Indeed, when it comes to the Part 27 Broadband Radio Service ("BRS") and the Educational Broadband Service ("EBS"), where new rules permit both higher-powered one-way and lower-powered two-way services to coexist, WCA has been a proponent of the use of an average power specification for base stations.[29]

[28] As Ericsson notes, "with an average limit, the rule will apply fairly to *all technologies* in a manner that provides a more accurate picture of power in the band." *Ericsson Comments* at 16.

[29] *See WCA Comments* at 3 (noting that, as a result of WCA's efforts, "the Commission has adopted BRS/EBS rules under which a maximum average EIRP . . . is imposed on BRS and EBS digital base stations"); *id*. at 5 n.3 ("WCA urged the Commission to retain the then-current rules and policies

Most certainly, there is no basis for such disparate treatment for 2.3 GHz WCS base stations, as it has no "relevance to the purposes of the Communications Act" and, without such, disparate treatment cannot be upheld.[30] Rather, as the Commission properly observes, "newer and more efficient" non-constant envelope technologies which exhibit deviations in peak versus average power are being deployed in numerous frequency bands, necessitating a change in the current peak EIRP limit which governs operators in these bands. *FNPRM* at ¶ 69. At least one 2.3 GHz WCS licensee, WCS Wireless, is intending to deploy one of these "new and more efficient" non-constant envelope technologies. WCA's request that *only* 2.3 GHz WCS licensees among Part 24 and Part 27 licensees operate with a peak EIRP limit will uniquely hinder WCS licensees from using these new and more efficient technologies, further impeding deployment in this spectrum which has long been fallow.

B. THE COMMISSION SHOULD ADOPT A POWER SPECTRAL DENSITY LIMIT FOR BASE STATIONS IN SERVICES REGULATED UNDER PARTS 24 AND 27

WCS Wireless and XM also support the Commission's proposal to adopt a PSD limit as an alternative to the per carrier EIRP limit for base stations in services regulated under Parts 24 and 27 of the Commission's rules. Using the Commission's proposed formula for calculating PSD limits, given that a narrowband system can transmit at least two carriers per MHz and that 2.3 GHz WCS base stations are limited to an EIRP of 2000 watts per carrier, WCS Wireless and XM urge the Commission to adopt a PSD limit of 4000 watts/MHz for 2.3 GHz WCS base stations. *FNPRM* at ¶ 62.[31]

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regarding base station power . . . which provided that . . . digital transmissions would be regulated based on average power").

[30] *See Melody Music, Inc. v. FCC*, 120 U.S. App. D.C. 241, 345 F.2d 730, 733 (D.C. Cir. 1965).

[31] *See Crown Castle Comments* at 5 (proposing a PSD limit of 4000 watts/MHz for the 1670-1675 MHz service based on the current 2000 watts per carrier EIRP limit for base stations in the band).

Adoption of a PSD limit will level the playing field in terms of aggregate base station EIRP between operators deploying narrowband and wideband technologies in services regulated under Parts 24 and 27 of the Commission's rules. WCA opposes the Commission's PSD approach. It claims that revising the EIRP limit for 2.3 GHz WCS base stations will result in interference to yet-to-be-deployed WCS receivers similar to the interference that would allegedly result if the Commission were to adopt an average power specification. *WCA Comments* at 4. Once again, WCA's claims of harmful interference are unfounded. As an initial matter, as numerous commenters explain, the Commission is not proposing to increase the power limits for Part 24 and 27 services, because operators deploying narrowband technology are already permitted to operate at an aggregate EIRP that exceeds the proposed PSD limit. *See supra* note 21. Moreover, even if some licensees deploy low-powered cellular networks, there is no reason to believe that a PSD limit would result in interference. The same entities that support adoption of a PSD limit have deployed or are planning to deploy low-powered cellular-like systems in the PCS and AWS bands.[32] In addition, as many commenters note, a PSD limit will permit wideband operators to cover the same geographic area using fewer base stations than would be necessary with a per carrier limit, resulting in a net reduction in interference potential. *See supra* note 22.

The flexibility to operate pursuant to either a PSD or a per carrier EIRP limit is particularly appropriate for the 2.3 GHz WCS bands, which the Commission intended to be used for a wide variety of services that could be provided using both narrowband and wideband

[32] *See CTIA Comments* at 7 ("CTIA's proposal . . . has the support of PCS licensees who operate the very co-channel and adjacent channel systems that would be subject to interference if operation under the proposed rules created the potential for increased interference. Their support reflects that these modifications for wideband emissions result in permitted radiated power levels equivalent to those currently allowed for narrowband emissions and thus do not constitute any increased risk of interference to ongoing – or future – operations.").

technologies.[33] In contrast, depriving the 2.3 GHz WCS band of an alternative PSD limit would create a regulatory bias in favor of low-powered cellular systems that use exclusively narrowband technologies. Once again, WCA provides no support for its request for disparate treatment of the 2.3 WCS GHz band. In fact, as with average power, WCA has been an advocate of the PSD concept for the Part 27 BRS and EBS.[34]

In addition, for entities such as WCS Wireless and XM that are proposing to use WCS spectrum to offer one-way services, the flexibility to operate base stations pursuant to a PSD limit is critically important. *See Crown Castle Comments* at 6. Without the ability to deploy base stations pursuant to a PSD limit, WCS licensees deploying one-way networks will be subject to a Commission-imposed technological disadvantage relative to their competitors in other frequency bands, such as Crown Castle in the 1670-1675 MHz band and QUALCOMM in the 700 MHz band, in direct contravention of the Commission's stated goal of achieving technological neutrality.[35]

[33] In establishing WCS, the Commission explained that WCS licensees are permitted "to provide a variety or combination of services," including but not limited to "interactive, high-speed, broadband data services, such as wireless Internet access; return links for interactive cable and broadcasting service; mobile data; satellite DARS; fixed terrestrial use; new and innovative services; radiolocation; educational applications; and wireless local loop." *See Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service, Report and Order*, 12 FCC Rcd 10785, ¶ 27 (1997).

[34] *See WCA Comments* at 3 (noting that, as a result of WCA's efforts, "the Commission has adopted BRS/EBS rules under which a maximum average EIRP [] varies according to channel bandwidth").

[35] *FNPRM* ¶ 56 ("The Commission seeks to promulgate rules that are 'technology neutral' because we believe that ideally it is in the public interest for competing telecommunications technologies to succeed or fail in the marketplace on the basis of their merits and other market factors, and not primarily because of government regulation.").

IV. CONCLUSION

Based on the foregoing, WCS Wireless and XM urge the Commission to (i) specify the EIRP limit for Part 24 and Part 27 base stations in terms of average rather than peak power; and (ii) adopt a PSD limit of 4000 watts/MHz for 2.3 GHz WCS base stations.

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